

CLAIMS

What is claimed is:

1. In a forced air HVAC system having a network of air ducts connecting a central discharge plenum to a plurality of air vents, a method for installing an air tube from said plenum to at least one of said air vents, comprising:

- 1) connecting a blower to said plenum;
 - 2) providing a flexible and expandable air flow restricting device adapted for passing through said air ducts and substantially restricting airflow at any location in said air ducts;
 - 3) providing a string connecting to said restricting device, said string sufficiently long to connect from said air ducts to said plenum, and sufficiently flexible to easily follow a path through said air ducts, and sufficiently strong so as not to break when used to pull an air tube through said air ducts;
 - 4) blocking all of the air vents but one air vent;
 - 5) inserting said restricting device into said one air vent;
 - 6) running said blower such that air flows at a rate sufficiently fast to pull said restricting device and said string from said one air vent to said plenum;
 - 7) providing tension on said string while letting out said string such that said restricting device moves through said air ducts at a practical and reasonable speed until said restricting device reaches said plenum;
 - 8) stopping said blower when said restricting device arrives at said plenum;
 - 9) connecting said air tube to said string at said one of air vents;
 - 10) accessing said string at said plenum; and
 - 11) pulling said string at said plenum such that said air tube is pulled from said one of air vents through said air ducts to said plenum;
- whereby said air tube is installed from said one of air vents to side plenum by accessing said air ducts only at said one of air vents and at said plenum.

2. The method of claim 1 further including repeating steps 4) through 11) for each of the other said air vents.

1 3. The method of claim 1 wherein providing said restricting device further includes:
2 providing a substantially square or round sheet of plastic film of area of approximately
3 the same size as a largest cross section area of any said air duct;
4 providing at least three strings of length approximately equal to a largest linear dimension
5 of said sheet;
6 connecting one end of each said strings approximately equally spaced around a perimeter
7 of said sheet; and
8 connecting the other ends of said strings to said string provided in said step 3);
9 whereby said flexible and expandable airflow restricting device is a simple parachute.

1 4. The method of claim 1 further including a method for enabling said restricting device to
2 pass by a snag, comprising:
3 a) sensing said tension in said string abruptly decreasing, indicating said restricting
4 device is snagged;
5 b) pulling said string back towards said air vent until said tension returns to an
6 approximate value before said snag;
7 c) releasing said string such that said restricting device quickly accelerates;
8 d) monitoring said string as said restricting device accelerates and reapplying said tension
9 to said string after said restricting device has passed said snag; and
10 e) repeating said steps b) through d) until said restricting device has passed said snag;
11 wherein a length of said string pulled back toward said air duct is varied and wherein the
12 rate of releasing said tension is varied;
13 whereby said restricting device passes by said snag.

1 5. A method of retrofitting a zone climate control system to an existing forced-air system,
2 the method comprising:

3 disposing an air tube within an air duct of the forced-air system by accessing the
4 forced-air system only at an air vent end of the air duct and at a conditioned air plenum of the
5 forced-air system;

6 coupling a bladder to the air tube by accessing the forced-air system only at the air vent
7 end of the air duct;

8 extending the air tube into the conditioned air plenum;
9 coupling a valve to the air tube at the conditioned air plenum; and
10 coupling a computer-controlled valve actuator to the valve.

1 6. The method of claim 5 further comprising:
2 thus disposing a plurality of air tubes each within a respective air duct of the forced-air
3 system;
4 thus coupling a plurality of bladders each to a respective one of the plurality of air tubes;
5 extending the plurality of air tubes into the conditioned air plenum;
6 coupling a plurality of valves each to a respective one of the plurality of air tubes at the
7 conditioned air plenum; and
8 coupling the computer-controlled valve actuator to the plurality of valves.

1 7. The method of claim 6 further comprising:
2 disposing a plurality of wireless thermometers each in proximity to a respective one of
3 the plurality of bladders; and
4 coupling a wireless receiver to the computer-controlled valve actuator.

1 8. The method of claim 7 further comprising:
2 programming the computer-controlled valve actuator with a temperature schedule.

1 9. The method of claim 6 further comprising:
2 coupling a bypass air duct between the conditioned air plenum and a return air plenum of
3 the forced-air system.

1 10. The method of claim 9 further comprising:
2 disposing a bypass bladder within the bypass air duct;
3 coupling a bypass air tube to the bypass bladder;
4 running the bypass air tube through the bypass air duct into the conditioned air plenum;
5 and
6 coupling the bypass air tube to one of the valves.

1 11. A method of installing a control system in an HVAC system which includes a plenum, at
2 least one trunk, and a plurality of ducts each having a vent, the method comprising:
3 coupling a blower to one of the plenum and the trunk;
4 operating the blower to provide airflow through the ducts into the one of the plenum and
5 the trunk;
6 inserting an air drag device into one of the vents, the air drag device having coupled
7 thereto one of a line and an air tube;
8 waiting until the air drag device has traveled from the vent substantially to the blower;
9 removing the air drag device from the HVAC system;
10 if the air drag device had the line coupled thereto, using the line to pull the air tube from
11 the vent substantially to the blower;
12 coupling a vent end of the air tube to an inflatable bladder disposed within one of the vent
13 and a duct coupled to the vent; and
14 extending a plenum end of the air tube into the plenum.

1 12. The method of claim 11 wherein:
2 the air drag device comprises a parachute.

1 13. The method of claim 11 further comprising:
2 repeating the steps from the inserting step onward, for additional ones of the vents.

1 14. The method of claim 11 further comprising:
2 blocking some of the vents to increase airflow through non-blocked vent(s).

1 15. The method of claim 14 wherein:
2 blocking a vent comprises using an oversized block of foam to block one of the vent and
3 a duct coupled to the vent.

1 16. The method of claim 14 wherein:
2 blocking some of the vents comprises blocking all but one of the vents at a time.

1 17. The method of claim 11 further comprising:
2 blocking all of the vents;
3 measuring a pressure within one of the trunk, the plenum, and the blower; and
4 in accordance with the measured pressure, determining an airflow in order to determine
5 whether there are leaks in the HVAC system.

1 18. The method of claim 17 further comprising:
2 the pressure being measured within the plenum; and
3 blocking airflow into an inward airflow end of the plenum, the trunk being coupled to an
4 outward airflow end of the plenum.

1 19. The method of claim 11 further comprising:
2 removing a grill from the vent prior to inserting the air drag device; and
3 replacing the grill after coupling the vent end of the air tube to the inflatable bladder.

1 20. The method of claim 19 further comprising:
2 providing an access hole through an accessed one of the plenum and the trunk;
3 coupling the plenum end of the air tube to a valve system including a pressure and
4 vacuum pump;
5 mounting the valve system at a location in close proximity to the plenum; and
6 sealing the access hole.

1 21. The method of claim 20 further comprising:
2 repeating the steps from the inserting step to the extending step, for additional ones of the
3 vents.

1 22. The method of claim 21 further comprising:
2 performing the steps from the inserting step to the extending step, for a bypass coupled to
3 the plenum.

1 23. The method of claim 21 further comprising:
2 performing the steps from the inserting step to the extending step, for a return air duct of
3 the HVAC system.

1 24. The method of claim 20 wherein:
2 mounting the valve system comprises coupling the valve system to the plenum.

—